UNIT 8 - RAM-AIR FLIGHT THEORY

RAM-AIR PARACHUTE TRAINING MANUAL

BLM SMOKEJUMPERS

CHAPTER 8 - RAM-AIR FLIGHT THEORY

This chapter is broken down into ten lessons:

I. Aerodynamics: Ram-Air flight theory
II. Flight Characteristics, Performance, and Techniques
III. Standard and Nonstandard Patterns
IV. Jump Technique Video
V. Jump Spot Selection
VI. Special Jump Spot Situations
VII. Fundamentals of Spotting
VIII. Jump Spot Weather
IX. Terrain Jumps
X. High Wind Jumps

CHAPTER OBJECTIVES
At the completion of this unit the student must:

1. Describe the basic concepts of Ram-Air aerodynamics.
2. Describe the 3 primary factors that affect the performance of the ram-air canopy.
3. Describe how the stall point of a canopy is identified and why it is important.
4. Draw glide angles for the full run, 1/4 brake, 1/2 brake, 3/4 brake, and stall brake settings. Identify the optimal glide angle brake setting, acceptable brake settings for landing, and the safety position toggle setting.
5. Describe how the planing maneuver is executed and identify good uses for it during a jump.
6. Describe a canopy's flight characteristics in the full brake setting (mushing, sinking, riding-the-ball) listing toggle position, forward speed, and descent rate.
7. List good uses, common mistakes, and watch-outs for the full brake setting (mushing, sinking, riding the ball).
8. Describe a canopy's flight characteristics during a stall and indicate a good use of the stall.
9. Identify the two types of toggle turns and list the characteristics of each type.
10. Describe front and rear riser turns and good uses for each.
11. Identify the three types of landing maneuvers listing advantages and disadvantages to each.
12. Identify the legs of a traffic pattern and cite suggested altitudes for each leg.
13. List advantages to flying a standard pattern.
14. Contrast standard patterns for high and low wind conditions.
15. Explain how wind variations will alter the standard pattern.
16. List Guidelines for Using a Nonstandard Pattern.

17. List Nonstandard Pattern WATCHOUTS.
18. Identify the four parts to every jump and verbally describe factors influencing proper techniques utilized in each part.
19. Verbally describe techniques that will minimize risks associated with varying jump conditions.
20. Identify and describe verbally desirable and undesirable jump spot characteristics.
21. Identify average wind direction based on landing location of streamers.
22. Determine average wind speed based on landing location of streamers and spotter's estimate of drift.
23. Explain how the presence of up or down air is determined.
24. Explain how wind variations will alter the standard pattern.
25. Identify 3 types of jump ship patterns that are used to drop jumpers.
26. Identify and describe verbally at least 5 special jump spot situations and accurately describe techniques for minimizing the risk of injury in these situations.
27. Identify and describe verbally at least 6 influential factors that are pertinent to jump spot selection and evaluation.
28. Describe verbally how given weather and topographic conditions can effect a landing on a given jump spot.
29. Accurately identify ground hazards, alleyways, and alternate jump spots on a given slide projection.

EQUIPMENT NEEDS

1 ea. - DVD "Jump Techniques" and monitor/.

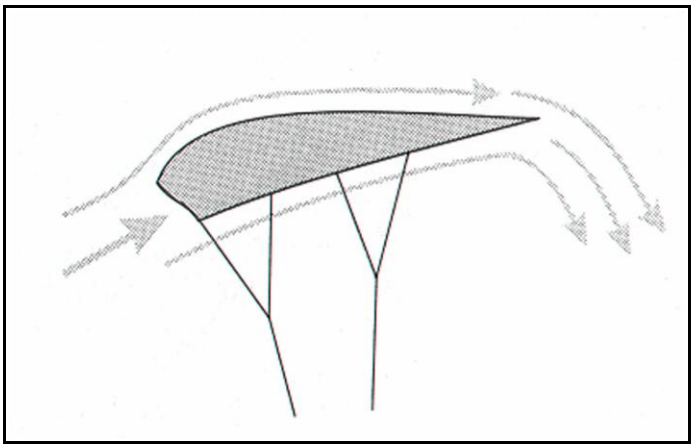
Lesson I RAM-AIR FLIGHT THEORY

This lesson introduces the students to the basic theory of Ram-Air parachute flight.

LESSON OBJECTIVE:

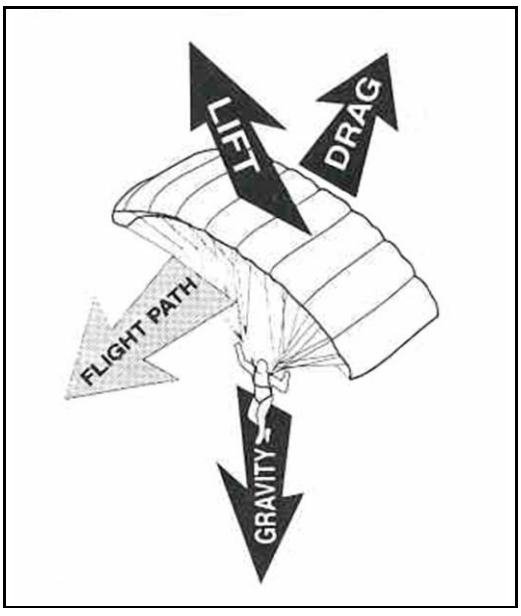
- **At the completion of this lesson the student will describe the basic concepts of Ram-Air aerodynamics and the generation of lift.**

EQUIPMENT NEEDS: none

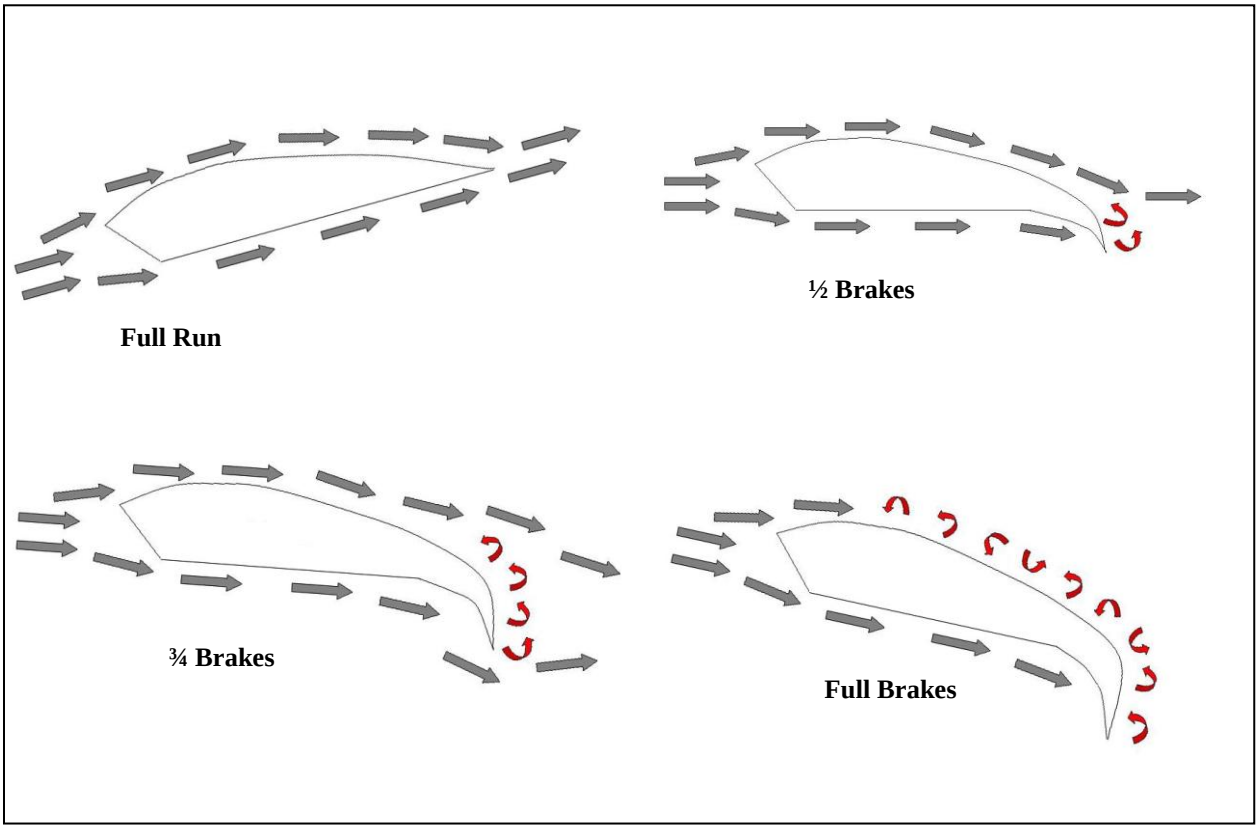


The ram-air parachute is an aerodynamically stiffened fabric wing that generates lift as it moves forward through the air. The airfoil's angle of attack is maintained by the relative lengths of the suspension lines; the leading edge of the wing is slightly lower than the trailing edge.

Thus, the airfoil-shaped canopy is forced to slide or plane through the air, similar to a glider in descending flight. The ram-air wing generates lift in the same manner, relying primarily on the reduced pressure of the air flow over the curved upper surface.



The leading edge of the wing is open or physically missing, forming intakes that inflate the cells. The internal air pressure causes a small amount of stagnant air to be pushed ahead of the airfoil, forming an artificial leading edge. The focal point of this stagnant air acts as a true leading edge, deflecting the relative wind above and below. Drag, which acts in a direction parallel to the relative wind, is the only force tending to retard the forward motion of the wing through the air. Gravity, plus the resultant sum of these aerodynamic forces on the upper surface, acts to "pull" the wing through the air, thus the flat glide angle.



Application of brakes on the parachute pulls the trailing edge down, creating additional drag and a loss of gliding speed. This also produces a proportionate loss in lift, resulting in a steeper glide angle. As full brakes are reached, the wing ceases to generate lift altogether, the result being a nearly vertical descent angle. Pulling the toggles beyond full brakes will cause the parachute to stall. The above figures illustrate the loss of lift associated with various brake settings.

Differential application of brakes (one side only or one side more than the other) produces an unbalanced drag force at the trailing edge, resulting in a yaw turn toward the side with the highest drag.

Because the "slow" side generates less lift, it tends to drop slightly in a shallow banking motion, much like an airplane. This bank angle increases as the difference between toggle pull increases.

Lesson II FLIGHT PERFORMANCE, CHARACTERISTICS, AND TECHNIQUES

The ram-air parachute is a flying machine. The jumper must understand flight performance capabilities and master a few techniques to get the most out of the parachute.

LESSON OBJECTIVE:

At the completion of this lesson the student will:

- **Describe the 3 primary factors that affect the performance of the ram-air canopy.**
- **Describe how the stall point of a canopy is identified and why it is important.**
- **Draw glide angles for the full run, 1/4 brake, 1/2 brake, 3/4 brake, and stall brake settings. Identify the optimal glide angle brake setting, acceptable brake settings for landing, and the safety position toggle setting.**
- **Describe how the planing maneuver is executed and identify good uses for it during a jump.**
- **Describe a canopy's flight characteristics in the full brake setting (mushing, sinking, riding-the-ball) listing toggle position, forward speed, and descent rate.**
- **List good uses, common mistakes, and watch-outs for the full brake setting (mushing, sinking, riding the ball).**
- **Describe a canopy's flight characteristics during a stall and indicate a good use of the stall.**
- **Identify the two types of toggle turns and list the characteristics of each type.**
- **Describe front and rear riser turns and good uses for each.**
- **Identify the three types of landing maneuvers listing advantages and disadvantages to each.**

EQUIPMENT NEEDS: none

I. CANOPY PERFORMANCE FACTORS

The performance of a ram-air canopy is primarily affected by the weight of the jumper, density-altitude, and movement of the toggles.

A. Weight of jumper and gear

The forward speed and descent rate of the ram-air is affected by the weight of the jumper and his equipment. A heavier jumper will have greater forward speed and a higher descent rate than a light jumper. A jumper has some control over how much gear is carried and thus his jump weight.

B. Density-Altitude

Hot temperatures and/or high altitude will result in greater forward speed and descent rate than in cool temperatures and/or low altitude.

C. Toggle movement

The ram-air parachute is very responsive to your commands. It will do what you make it do. When you decide to perform a flight maneuver, you make the decision based on what you see and feel. If you are in a steeply banked turn or are swinging under the canopy, it is difficult to make a good flight decision because canopy response lags behind your commands.

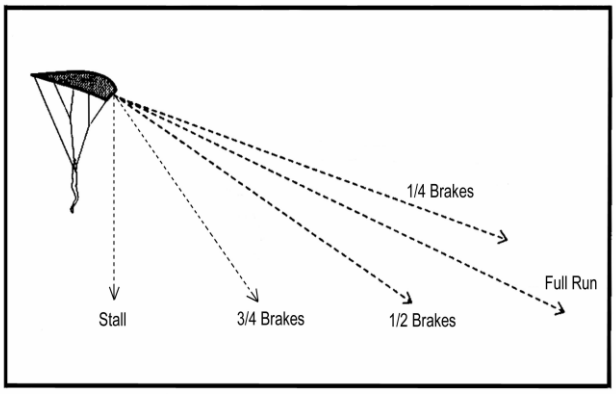
In other words, if you fly from an unstable platform or if you over-control, you will not get maximum performance. Slow, gentle toggle movements help a jumper avoid disorientation. And in the case of deep brake flight and stall recovery, are required to avoid hard landings. It is better to fly with the toggles kept fairly close to the body than with outstretched arms. This technique helps reduce arm fatigue, provides more accurate identification of the stall point, and helps prevent outstretched arms when performing PLFs.

II. STALL POINT

The stall point is the toggle position at which the canopy will cease forward flight and begin to enter a stall. The stall point is typically located with a toggle position near the bottom of the reserve. The location of stall points can vary significantly from canopy to canopy. Minor variances in stall point location can exist on the same canopy depending on density altitude and wing loading. Positive identification of the stall point on every jump is critical for jump safety and performance. The stall point is located by slowly and smoothly lowering the toggles until the canopy ceases flying.

III. STRAIGHT AHEAD MANEUVERS

The various straight ahead maneuvers are used to affect the glide angle of the canopy. Canopy glide angles can be changed by manipulating either the steering toggles or the risers. The figure to the right shows the glide angles for a ram-air canopy at the various toggle settings. Note that the 1/4 brake setting provides the flattest glide angle.



Brake Setting Glide Angles

A. Full Run

- Toggles are all the way up
- Greatest forward speed of any toggle setting, 20-25 mph
- Greatest descent rate of any toggle setting aside from sink/stall, 12-16 fps
- Not acceptable toggle position for landing

Full run is the quickest way to get from point A to point B when retention of altitude is not a concern. If getting blown backwards on final, it will allow a jumper to land closer to the spot than any other toggle setting. Common mistakes include overuse while in the pattern and using too long in the presence of turbulence. *WATCH OUT: The canopy is susceptible to turbulence at this brake setting.*

B. 1/4 Brakes

- Toggles are 1/4 of the way between full run and stall point
- Forward speed is 13-17 mph
- Descent rate is 11-14 fps
- Optimal glide angle for most canopies
- Not acceptable toggle position for landing

The 1/4 brake setting provides the optimal glide angle. For example, 1/4 brakes is the best choice if the jumper turned on final too far downwind and is trying to make it back to the jumpspot providing he is making forward progress. The 1/4 brake setting is the preferred starting point for a dynamic or staged flare. A jumper will realize most of the benefits of starting a flare from 1/4 brakes without as much risk of the canopy being negatively effected by

turbulence.

C. 1/2 Brakes

- Toggle position is halfway between full run and stall point
- Forward speed is 9-12 mph
- Descent rate is 9-12 fps
- Canopy is least susceptible to turbulence
- Acceptable toggle position for landing
- SAFETY POSITION, SAFETY POSITION, SAFETY POSITION

1/2 brakes is also referred to as the safety position. The canopy is least susceptible to turbulence at this brake setting and both forward speed and descent rates are acceptable for landing. 1/2 brakes also gives a jumper the maximum flexibility to adapt to changing wind conditions, especially useful on final. Higher in the pattern, this brake setting is useful as it allows a jumper more time to make decisions and allows for higher margins of error than do 1/4 brakes or full run.

D. 3/4 Brakes

- Toggle position is 3/4 of the way between full run and stall point
- Forward speed is 5-8 mph
- Descent rate is 10-14 fps
- Acceptable toggle position for landing
- WATCH OUT: Brake setting is close to stall point

3/4 brakes is useful for making a steep descent into a tight spot. It is also useful to minimize overshooting if the 1/2 brake sight picture was misjudged. Jumpers need to be cautious about not drifting into deeper brake settings inadvertently. It is a natural reaction to move the toggles lower when overshooting and this will put the canopy very close to its stall point. Also, moderate to severe turbulence can cause the canopy to stall.

E. Full brakes, sinking, mushing, and "riding the ball"

- Toggle setting is exactly on stall point
- Forward speed is 0 to 5 mph
- Descent rate is 16 to 24 fps
- Variance between canopies can be significant
- Extremely unacceptable toggle position for landing

The full brake setting is an extremely useful tool for making an accurate jump but is dangerous if used inappropriately. Full brakes are an effective tool for losing altitude on final or making a

descent into a tight spot in tall timber. Many jumpers have been injured by using this brake setting at too low of an altitude. DC-7 canopies are prone to surging when coming out of this flight mode. The canopy can transition unexpectedly into a stall in the presence of turbulence and sustained use can result in canopy transitioning into a stall. Only experienced jumpers should use below 200' AGL and the canopy should be flying by 100'AGL.

E. Stall

- Toggles are lower than stall point
- Forward speed is 0
- Descent rate is 20 to 26 fps
- Canopy may have directional instability
- DC-7: Recover by smoothly raising both toggles to the 3/4 brake position and hold until the canopy begins to fly.
- Extremely, extremely unacceptable brake position for landing

The stall maneuver is an effective tool for losing altitude. It is best used prior to entering the pattern or during the downwind leg. Riding the ball or sinking is usually the better choice for losing altitude during the base and final legs. The stall maneuver should not be utilized lower than 300' AGL. It is extremely likely that a landing in this mode will result in a serious injury. Transitioning out of the stall maneuver should be done by smoothly raising both toggles and holding until canopy begins flying again... DC-7s should regain flight at the 3/4 brake position. Snapping the toggles up or raising them to a very high setting can result in an extreme surge causing a rapid dive and high forward speed.

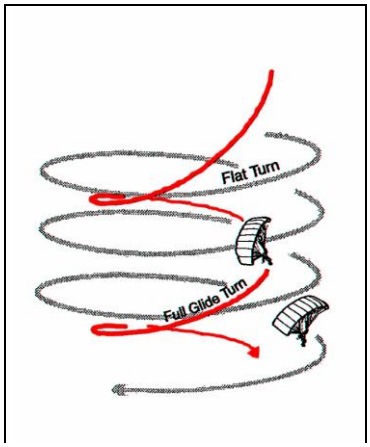
F. Planing

- Front risers are pulled down to increase the canopy's angle of attack
- Forward speed increases, 25-30 mph
- Descent rate increases, 16-20 fps
- Mating velcro on toggles and risers reduce difficulty in retrieving toggles, however, holding on to the toggles does not significantly affect the canopy's ability to plane.

Planing provides the maximum forward speed possible but it also results in a greater descent rate. Planing is an effective tool for holding into wind when the wind speed exceeds the forward speed of the canopy at full run. The maneuver shouldn't be used lower than 200'AGL as the canopy is very susceptible to turbulence in this flight mode. Jumpers also need to consider the time needed in transitioning back to toggles before employing the planing maneuver at lower altitudes.

IV. TURN TYPES

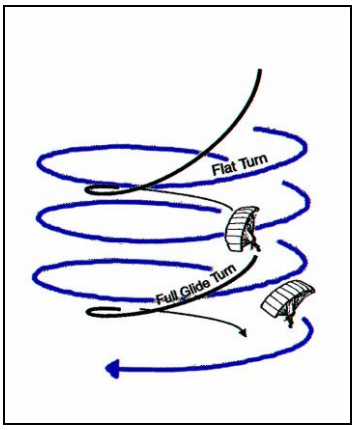
A. Toggle Turns (2 types)



Full Glide Turns

- Toggle is pulled all the way down on the side you want to turn while the other toggle is left at full run
- Canopy banks similar to an aircraft
- Canopy takes 4 to 6 seconds for first turn
- Turn rate, degree of bank, and descent rate will increase with time
- Turns held beyond a full revolution are called spiral turns
- The jumper will feel increased pressure in the harness and airspeed increasing
- Because of the increased descent rate, never make full glide turns below 300 feet AGL

Full glide turns are an effective tool for turning but subjects the jumper to more banking than off-hand turns. Sustained full glide turns (spiral turns) are an effective maneuver to lose altitude, but not as effective as front riser bomb turns. Common mistakes made while employing the spiral turn include losing track of altitude and coming out of the turn in the wrong direction. This maneuver can often result in a jumper becoming dizzy and disoriented. It is extremely important to ensure that the airspace is clear below and downwind of the jumper prior to executing the turn.



Off-Hand Turns

- Initiated while flying in a partially braked mode
- Toggle is raised on opposite side from desired turn direction
- Canopy banks much less compared to a full glide turn
- Turn speed is quicker, especially at low speeds
- Canopy pivots on its axis

The reduced banking associated with off-hand turns makes it the preferred type of turn for many parts of the jump. Using off-hand turns while turning between legs of the pattern helps to minimize turn times. Utilizing off-hand turns for making corrections on final will result in a better sight picture. Also, gentle off-hand turns can be safely utilized to avoid obstacles near or on the ground. Off-hand turns are generally preferred over full glide turns.

B. Front Riser Turns

- Toggles should be put in full run position
- Initiated by pulling down either riser on side of desired turn
- Can use dive loop on riser or grab any upper part of front riser
- Canopy will bank significantly
- Turn rate, descent rate, and speed will be very high and increase over time
- Turns held beyond a full revolution are called bomb turns

Sustained front riser turns are an effective tool for gaining vertical separation early in a jump. Bomb turn is the term used to refer to a sustained front-riser turn. The same watchouts listed under full glide turns apply to sustained front-riser turns. Bomb turns are an effective maneuver to lose altitude. Common mistakes made while employing the bomb turn include losing track of altitude and coming out of the turn in the wrong direction. This maneuver can often result in a jumper becoming dizzy and disoriented. It is extremely important to ensure that the airspace is clear below and downwind of the jumper prior to executing the turn. Front riser turns are also effective to make steering corrections while planing.

C. Rear Riser Turns

- Leave toggles stowed if used in case of imminent collision after opening
- Release toggles from stows if used in the case of a broken brake line
- Initiated by pulling either rear riser down on side of desired turn
- Grab the upper part of rear riser
- Turns are effective but require more force than pulling down a toggle

Rear riser turns are not commonly employed during the course of normal jumps. However, they are a very valuable in certain situations. If a jumper is faced with an imminent canopy collision after opening, a right riser turn will result in a quicker turn than unstowing the brakes and making a toggle turn. The second situation demanding rear riser turns would occur in the case of a broken brake line or detached toggle. In this case it is preferable to steer with rear risers than to make turns with the sole functioning steering line. Rear riser turns are similar to toggle turns in that they deflect the rear sections of the canopy. They require more force to execute due to the fact that the jumper is pulling down a larger area of the canopy. Pulling down a rear riser will pull all of the C and D lines on that side compared with just the trailing edge for a toggle turn.

V. LANDING MANEUVERS

A. 1/2 Brake Landing

- The 1/2 brake setting provides for an acceptable landing due to the low descent rate and moderate forward speed.
- Allows for the greatest accuracy
- Best defense against turbulence

1/2 brake landings are often the best choice for jump spots that require a high degree of accuracy and/or have turbulence present. Virtually no timing is required so it is an easy maneuver to execute. Accuracy is increased due to the ease of maintaining a consistent sight picture. The canopy is least susceptible to turbulence at the 1/2 brake setting so oscillations will be minimized.

A somewhat lighter landing can be obtained by "punching out" from the 1/2 brake setting. About 5-10 feet off the ground slowly depress both toggles to the stall point coinciding with touchdown.

B. Staged Flare

- Converts forward speed of the canopy into lift
- Toggles are moved from full run or 1/4 brake setting to stall point in incremental steps with pauses at 1/2 brake and 3/4 brake settings.
- Allows jumper to hold safe brake setting if timing is off or turbulence is encountered

Staged flares are a good compromise between 1/2 brake landings and dynamic flares. Landings can be lighter than with a 1/2 brake landing and a staged flare has two significant advantages over a dynamic flare. First, the staged flare doesn't require as much precision to execute. Secondly, the staged flare can be terminated and a safe brake setting can be held if timing is off and/or turbulence is encountered. Additionally, staged flares help a jumper develop their timing for executing a dynamic flare. Proper altitudes to initiate are very dependent on density altitude with high density altitudes requiring the jumper to initiate at a higher altitude than at low density altitudes. See the following section on dynamic flares for further details.

C. Dynamic Flare

- Converts forward speed of the canopy into lift.
- Toggles are moved from full run or 1/4 brake setting to stall point in a smooth continuous manner just before landing.
- At completion of maneuver, forward speed will be 0-5 mph and descent rate will be 0 fps for a short duration (1-2 seconds). Descent rate will increase dramatically to that of a full stall, 20 to 26 fps, with severe oscillations if the flare is initiated and

completed too soon in the landing approach.

Dynamic flares provide the opportunity for the lightest possible landing. However, there are significant drawbacks compared to the staged flare or 1/2 brake landing. A high degree of timing is required, jump accuracy is reduced, and the canopy is more susceptible to turbulence. A poorly executed dynamic flare will result in the jumper landing with an extreme amount of forward speed, a very high descent rate, or both. Dynamic flares are best used when the jump spot doesn't require great accuracy and is free from turbulence.

Beginning the flare from 1/4 brakes or less instead of full run offers two advantages. First, the canopy will surge less if the final was flown at the 1/2 brake or lower setting. Secondly, the canopy is less susceptible to turbulence at the 1/4 brake setting than the full run setting. There is not a hard and fast rule as to what height a jumper should begin initiating the flare as many factors come into play. The general rule of thumb is to time the flare so the toggles are reaching the stall point simultaneously with the feet hitting the ground. This doesn't allow the canopy time to transfer all of the possible lift but it is better to be too late than too early.

Instructors should provide a designated altitude based on the conditions and altitude (i.e. 20' AGL) to students who are first learning the flare and experienced jumpers must adjust the altitude as appropriate for the given conditions and situation. The primary factor is density altitude but jumper weight and canopy type also need to be taken into consideration. Low density altitudes mandate a lower initiation point than high density altitudes. Heavier jumpers need to initiate flare slightly earlier than lighter jumpers.

FLIGHT PERFORMANCE, CHARACTERISTICS, AND TECHNIQUES

ITEMS TO COVER

__weight of jumper	__planing
__density altitude	__full glide turns
__toggle movement	__off-hand turns
__stall point	__riser turns
__straight-ahead maneuvers	__1/2 brake landing
__full run	__staged flare
__1/4 brakes	__dynamic flare
__1/2 brakes	
__3/4 brakes	
__full brakes (mushing, sinking, riding-the-ball)	
__stall	

Lesson III PATTERNS

This lesson describes to the student the terminology, and nuances of standard and nonstandard patterns. It will also explain how wind variations will alter a standard pattern.

LESSON OBJECTIVE:

At the completion of this lesson the student will:

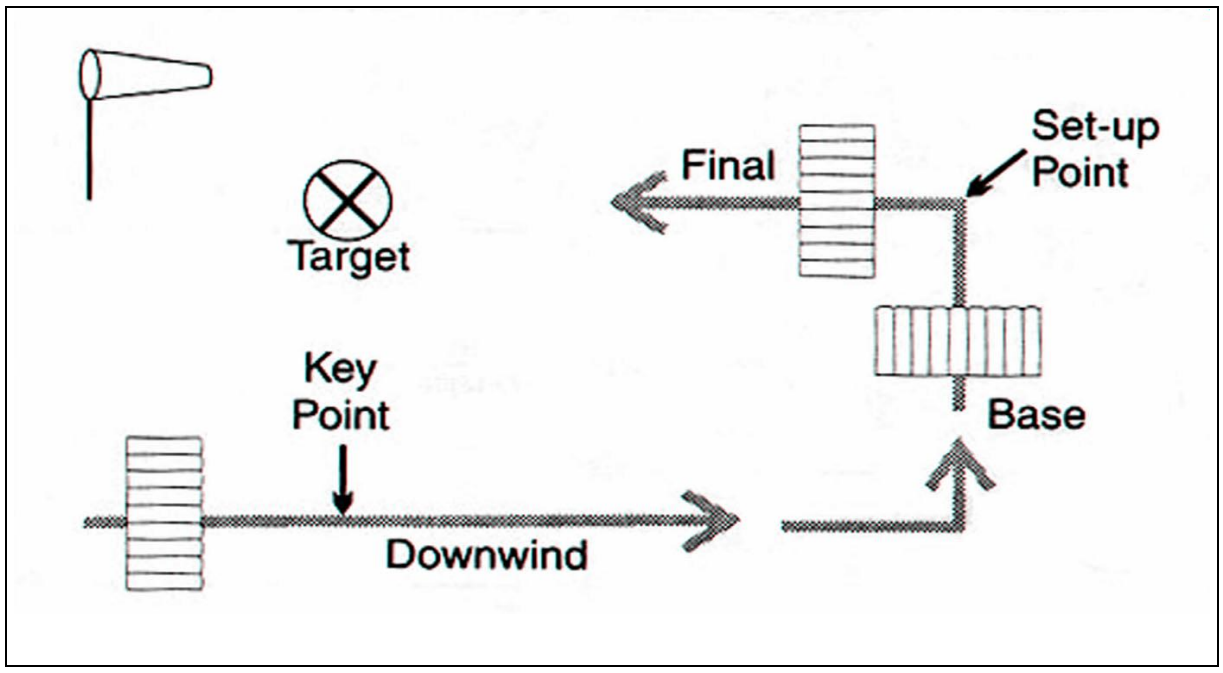
- **Identify the legs of a traffic pattern and cite suggested altitudes for each leg.**
- **List advantages to flying a standard pattern.**
- **Contrast standard patterns for high and low wind conditions.**
- **Explain how wind variations will alter the standard pattern.**
- **List Guidelines for Using a Nonstandard Pattern.**
- **List Nonstandard Pattern WATCHOUTS.**

EQUIPMENT NEEDS:

1 ea. - Flip chart/Dry Erase Board or PowerPoint Projector and Pattern Presentation.

I. STANDARD PATTERN

Flight patterns used under canopy fit into two categories: 1) Standard Pattern and 2) Nonstandard Pattern. The appropriate choice for a particular jump depends primarily on wind speed. It is generally preferable to use the standard pattern when wind speeds are 15 mph or less, in other



Standard Pattern

words, when the drift streamers show 500 yards or less.

The standard pattern is based on the traffic pattern used by aircraft prior to landing. The pattern can be left or right hand, defined by the direction of turns used in the pattern. For example, a jumper flying a left hand pattern would be making left hand turns when turning between the legs of the pattern. The standard pattern offers many advantages to the jumper in the areas of accuracy and safety. The standard pattern allows for a good inspection of the jumpspot and makes it easy to monitor changes in wind direction or speed during the jump. It also lends itself well to making adjustments for changing conditions. Most importantly, it provides an orderly landing sequence for multiple jumpers in the air. Components of the pattern include: Key Point, Downwind Leg, Base Leg, Setup Point, and Final.

Key Point

- Point at which the jumper enters the pattern
- Approximately 1500' AGL

- Cue to release upper RSL snap shackle

Downwind Leg

- Begins at Key Point, approximately 1500' AGL
- Ends with turn onto Base Leg approximately 1000' AGL

Base Leg

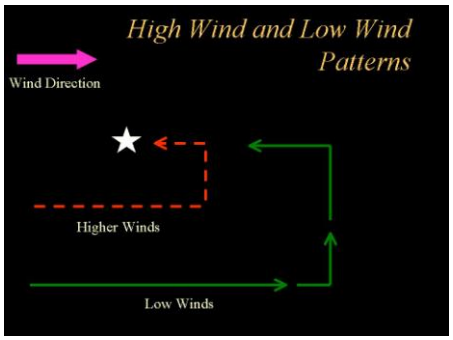
- Begins at end of downwind leg, approximately 1000' AGL
- Ends with turn onto final, approximately 300' to 500' AGL

Final Leg

- Begins at end of base leg (Setup Point), approximately 300' to 500' AGL
- Ends with landing

1. Guidelines for Using Pattern

- Standard pattern is effective in winds up to 15 mph.
- Minimize flight over hazards
- Ideal to fly at 1/2 brake setting. The 1/2 brake setting allows jumper to speed up or slow down as needed. Also, it is easier to make good decisions at slow airspeeds.
- Generally better to err too high on altitudes than too low. Can use sink to lose altitude but it's difficult to get gravity to take you back up.

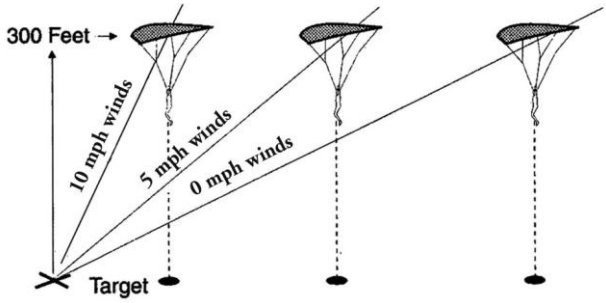


2. High and Low Wind Patterns

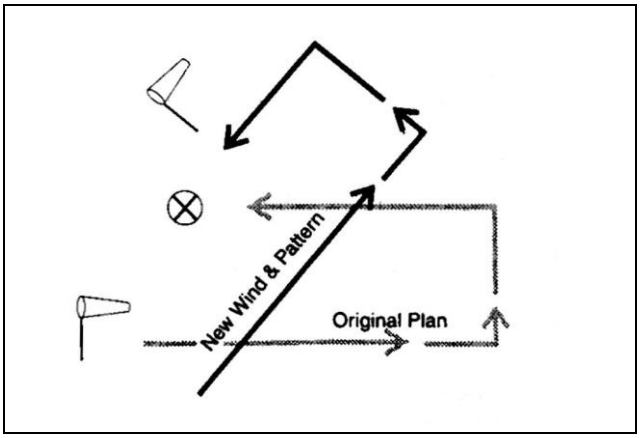
Tighten pattern as wind speed increases, downwind leg should be closer to wind line and the setup point will move closer to jumpspot.

3. Setup Point

The proper setup point downwind of the jumpspot will vary according to wind speed. The distance downwind decreases with an increase in wind speed. It is ideal to fly from setup point to jumpspot at 1/2 brakes. In high wind situations it is possible for the setup point to be directly above the jumpspot or even upwind. The accompanying figure shows approximate

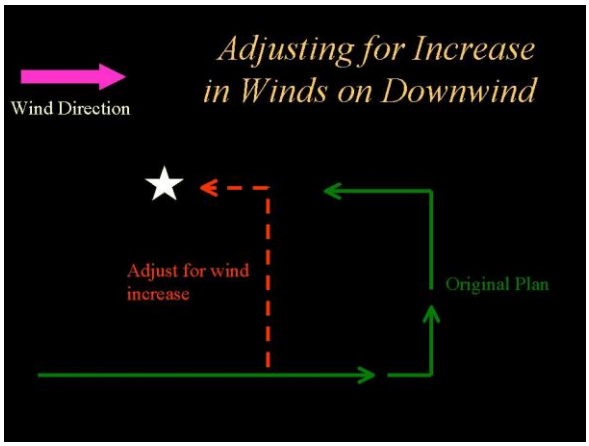


glide angles for a final flown at the 1/2 brake setting.



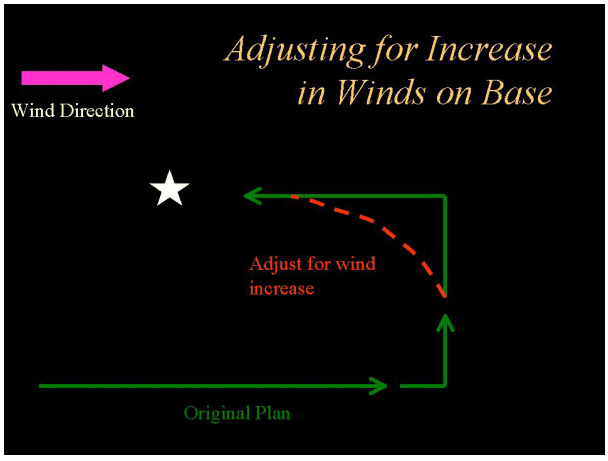
4. Adjusting for Changes in Wind Direction

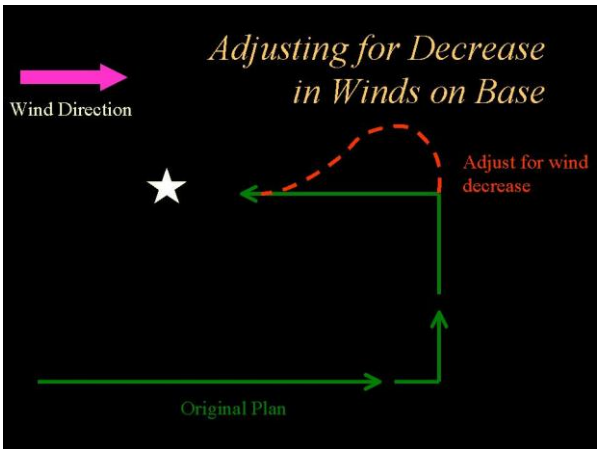
It is not uncommon for the wind to change during the course of jump operations. Most changes are minor and can be corrected for by slight adjustments on final. If the change in wind direction is significant AND it is recognized prior to entering the pattern, it may be preferable to shift the entire pattern. Shifting the pattern will increase the potential for landing directly into the wind but jumpers should be cautious to avoid chasing the windsock with light and variable wind conditions.



5. Adjusting for Changes in Wind Velocity

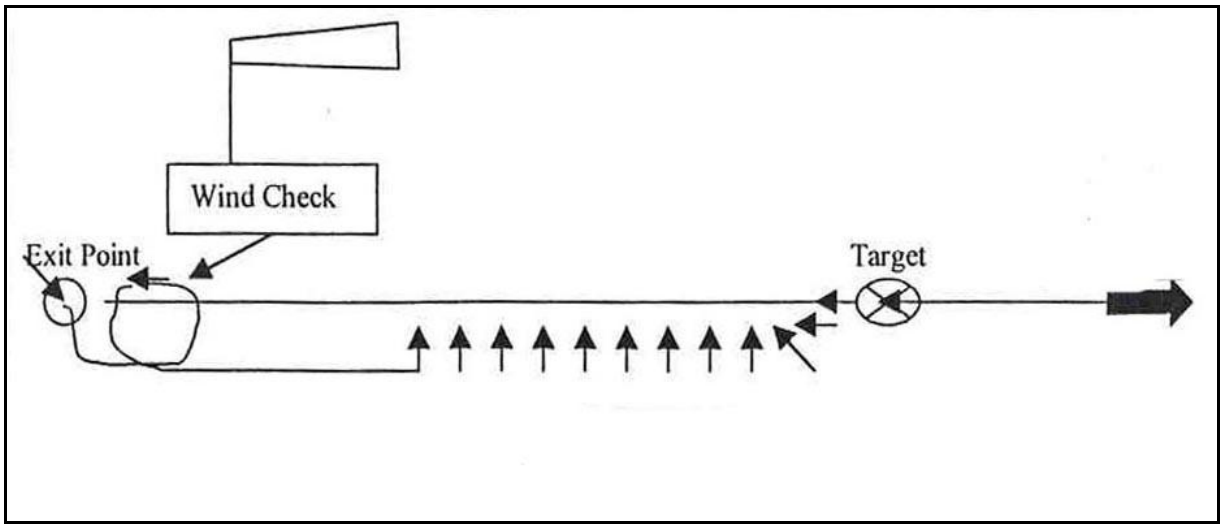
When winds increase during the jump it is important to recognize the change and make the necessary adjustments. Most adjustments are fairly straightforward and entail reducing the distance traveled on the downwind leg or "cutting corners" of the base leg. Adjusting for a decrease in winds doesn't always require changing the pattern. Sinking or mushing from the original setup point will usually result in an acceptable sight picture. Extending the base leg is acceptable if you are the last jumper in the stick but the potential for airspace conflicts increases.




Adjusting for Decrease
in Winds on Base
Wind Direction
Adjust for wind
decrease
Original Plan

II. NONSTANDARD PATTERNS

Nonstandard patterns are most commonly used during high wind jumps (15 mph or greater or 500 yards drift or greater) but can also be used when hazards or terrain features would prevent a safe and accurate standard pattern jump. Nonstandard patterns are characterized by minimal or no flight downwind of the jump spot, minimal or no flight in downwind direction, and the



Nonstandard Pattern

majority of flight occurs close to the wind line.

1. Guidelines for Using a Nonstandard Pattern

- Make it part of your plan
- 1st jumper in stick should get vertical separation early. If using bomb turns, be careful not to come out of turns facing downwind.
- Be extra careful maintaining airspace awareness. 2nd jumper will likely have difficulty maintaining a visual on JP while backing in.
- Crabbing is generally better than backing in as it allows quicker reaction to wind changes.

2. Nonstandard Pattern Common Mistakes

- Lack of vertical separation in lower part of jump.
- Not being prepared to adjust to changes in wind velocity down low.

3. Nonstandard Pattern WATCHOUTS

- Harder to predict where your JP will be.
- Lighter jumpers will be ab n heavier jumpers
- 2nd jumper will often have more difficulty maintaining sight of JP.

PATTERN ITEMS TO COVER

__standard pattern	__adjusting pattern for wind changes
__key point	__nonstandard patterns
__downwind	__guidelines for using a nonstandard pattern
__base leg	__nonstandard pattern common mistakes
__final leg	__nonstandard pattern watch outs
__guidelines for using standard pattern	
__high and low wind standard patterns	
__setup point	

Lesson IV RAM-AIR PARACHUTE JUMP TECHNIQUES VIDEO

This lesson describes to the student the four parts of every jump: The Plan, The Jump, Turning Final, and The Landing.

LESSON OBJECTIVE:

At the completion of this lesson the student will:

- **Identify the four parts to every jump and verbally describe factors influencing proper techniques utilized in each part.**
- **Verbally describe techniques that will minimize risks associated with varying jump conditions.**

EQUIPMENT NEEDS:

1 ea. - DVD "Ram-Air parachute Jump Techniques" and monitor.

AFTER SHOWING THE VIDEO, THE INSTRUCTOR SHOULD STATE VARIOUS JUMP CONDITIONS (HIGH WINDS, NO WINDS, 4 PERSON STICKS, SMALL JUMP SPOTS, ETC.) AND ASK THE STUDENTS WHICH TECHNIQUES MAY MINIMIZE RISKS IN THESE GIVEN CONDITIONS.

The following is the script from the video tape on jump techniques. Students should use this as a reference for study and discussion.

The purpose of this tape is to reinforce techniques which will make for the best possible landings using the Ram-air parachute. We will review some basic procedures which lead to a successful jump and present some specific tips for getting into small timber spots.

Part One: The Plan

A good jump starts with a good plan made while still in the airplane.

Good communication with the spotter and between the jump partners is essential to making an effective plan.

Picking the best jump spot, proper size up of the spot, jump spot weather and the approach you will make into the spot are topics for discussion between jumpers and spotter.

It is especially important for the first jumpers to get their faces in the door, gathering information about the jump. The time to adjust gear is not during the initial size up of the spot.

A low pass with the airplane to check out the spot more closely is highly desirable.

The first jumpers should become thoroughly familiar with the jumpspot so it will be easy to find during the jump.

Alternate spots should be identified and noted. Discuss your plan B with your jump partner. Plan B can be as simple as showing your jump partners your alternate spot.

Hazards such as rocks and downfall in the jump spot should be identified and noted.

Alleyways into the desired spot and run-outs leaving the desired spot should be identified.

In timber jump spots, the alleyway may consist of some type of opening leading to the spot, or it may be a stand of smaller, jumper friendly trees leading to the spot.

Alleyways are useful in that they help reduce the steep angle of descent to get into the spot and can provide the alternate spot needed if the wind conditions change or the final approach is misjudged.

Jump spot weather should be analyzed and discussed with the spotter.

Factors such as the wind speed and direction are important, even in very low wind situations.

Even a light wind can make a big difference in reducing forward speed on landing. Wind indicators, such as drift smoke from the fire, should be monitored.

The jumpers should be aware their forward speed will increase in areas where the upper wind is blocked by timber canopies or terrain features.

The route of the planned pattern should minimize the hazards the jumpers will overfly, especially on final approach.

And the plan should include who is to go low in the stick.

Particular care needs to be taken because no wind allows jumpers to approach from virtually any angle.
Constant monitoring of airspace and location of all jumpers in the air is essential.

If it is a tight spot, a single man stick is advisable.

Summary of Part One "The Plan"

A successful jump starts with a good plan. If you anticipate the conditions you will encounter during the jump, you will minimize problems on landing.

Establish good communications with the spotter and your jump partner--**GOOD COMMO.**

When you arrive at the scene, gather as much information as you can about the spot--**SIZE UP THE SPOT**.

Analyze the jump spot weather --**JUMP SPOT WEATHER.**

Know the direction of the wind--**DIRECTION OF WIND.**

Identify alternate spots--**ALTERNATE SPOTS.**

Look for alleyways into the spot and exits out of the spot -- **ALLEYWAYS.**

Decide on a left or right hand pattern that will give you the best final approach into the spot-- **THE PATTERN.**
Decide who is going to go low--**WHO GOES LOW.**
(Live shot of exit--jumper counts) Jump thousand, look thousand, reach thousand, wait thousand, pull thousand; (graphics spell out opening checks) check my canopy, check my airspace, check my controls.

After jumping out and doing your opening checks, it is nice to take a deep breath, relax for a moment and realize that life is good.

Then you orient toward the spot. Point the canopy toward the spot and slowly begin pulling the toggles down. Slow the canopy down.

A slow-flying canopy gives you more time to make decisions about your jump, so a half-brake setting from your wind check on is desirable.

As you orient to the spot and slow the canopy down; continue slowly pulling down the toggles until you find the stall point.

It is essential that you are thoroughly familiar with that particular canopy's stall point. It is an extremely hard on your body to have the canopy fall off into a stall on landing.

Remember, finding the stall is not a matter of going from full run or half brakes and just cranking the toggles down and eventually the canopy falls off and stalls.

To find the true stall point, you must slow the

Part Two: The Jump

And if things change--PLAN B.

canopy down to where it is barely flying. It will go into a sink and with a tiny bit more pull on the toggles; it will slip off into a stall. The ability to move from this slow flight to a sink, a stall, and back to safe flying again can be an excellent tool in making an accuracy approach, which is a useful way to get into the tight spot.

So, you've done your stall check and say, you turn into the wind for a wind check somewhere just upwind of the spot. If it is indeed a no-wind day, you will notice that you are penetrating quite well even in your deep brake slow-flight mode.

Release your RSL, etc.

So you turn to do your downwind the way you planned in the airplane. Remember to keep the canopy flying slow, at say half brakes, as you do off hand turns toward your downwind leg.

As you fly downwind, you are offset at an angle so you don't fly directly over the spot. You keep your eye on the spot and also check your airspace.

Watch other jumpers from the stick ahead of you, if possible. How far downwind did they go? Are they overshooting or undershooting? Are they landing with a lot of forward speed?

At a certain point, you will turn your base leg,

still using the offhand turn and still flying the canopy slowly at half brakes.

Summary of "The Jump"

Here are some key points to remember about the jump itself after making your opening checks.

You Orient to the Spot--**ORIENT TO THE SPOT**. Identify the spot and point the canopy Somewhere upwind of the spot, do a good --**WIND CHECK.** The wind check will help determine your pattern.

Release your RSL--after the wind check and before you begin your pattern.

As you turn to do your downwind leg of the pattern, it is best to fly at --**HALF BRAKES.**

...and make off-hand turns--**OFF HAND TURNS** as you turn from downwind to base and then final approach.

Part Three: Turning Final

As you turn final toward that tight spot, it is payoff time for all the planning and thought you've given to your jump so far.

Your pre-jump plan, your jump spot weather observations, your stall check and your slow flight in the pattern has put you in position for the best possible final approach and landing.

Having a lot of altitude as you turn final is useful because it gives you more time to make adjustments to your descent--your sight picture--as you descend to the spot.

If you have timed your turn in to final perfectly, after turning from your base leg to final, you will be able to descend to the spot still holding half brakes.

It is rare that such perfection occurs. More commonly, a jumper will need to increase or decrease forward speed to establish a good angle to descend.

Most commonly, the jumper will turn in too soon on a no-wind day. It is a natural reaction to not want to willingly commit yourself too far out over the trees, so you've fudged a little bit and turned in too soon.

Anyway, it is probably for the best. If you are high and steep on final, and erring on being a little too steep, you are still in a good position.

Because just in case the wind is stronger than you thought, if you are high and steep, you won't find yourself hanging out over the timber too far and not making it back.

But let's assume the wind is calm. And you feel that if you stay at half brakes, you will overshoot the spot.

So as not to overshoot, you can make the sight picture angle steeper if you slow the canopy down even further.

towards it.

On the way back to you spot, you will slow the canopy down and do a --**STALL CHECK.** Every canopy is a little different as to where it stalls, so check it every time.

Ease the toggles up and practice some--**SLOW FLIGHT**....gives you more time to consider your plan for landing.

The idea is to give you the best possible angle of descent into the spot by adjusting your sight picture.

This is where your skill in slow flight, sinking the canopy and stalling the canopy will come into play.

If your angle is too steep on final and you feel you will overshoot the spot, slowly pull the toggles down until the canopy is sinking. This is also called mushing the canopy or riding the ball.
Easing the toggles back up will stop the stalling action and the canopy will return to flight. It is important to develop your skill in smoothly and slowly easing out of the sinking mode.

It will be difficult to regain your sight picture if you are too radical with the toggles. Allowing the canopy to surge excessively will result in a stair stepping action with the jumper overcompensating each time.

If you throw your hands up, the canopy will surge forward, the descent rate will momentarily increase and the jumper will probably fly forward and lose the ground gained while sinking the canopy.

A smooth transition from slow flight to safe flight is the key to success using this type of approach.

With experience, you should develop a "feel" for the canopy that will tell you when the canopy is flying, sinking or stalling and you can bring it in and out of each mode smoothly.

Plan and fly a good, formal pattern. If in doubt at any time, go to half brakes.

The Quantum parachute excels in this mode and it will remain a stable platform when eased into this sink.

If you pull the toggles down even further, you fall off into a stall. The stall is useful if the jumper needs to back the canopy up quickly to improve the sight picture angle.

With practice, you can sink the necessary distance vertically to improve your sight picture without moving forward very much.

A final note on the final approach: Remember, no man's land is being directly over the spot with say, 300 feet of altitude left to go.

You are too low to do a 360 and too high to make it into the spot.

On a no wind day going into a tight timber spot, you have to commit yourself out over the trees on final to get a good angle to keep the canopy flying to the ground.

If you have miscalculated your angle of descent, don't make it worse by doing something radical at this point.

It would be far worse to crank a low turn creating the possibility of a severe oscillation into the ground or colliding with your J.P.

It is time to go to your alternate spot, slow down with your toggles to half brakes.

The half brake setting is intended to minimize your risk on landing.

Summary of "Turning Final"

As you turn from your base leg to final approach, keep in mind these points:

If you had perfect timing and judged the wind exactly, you could fly your pattern, turn final and come in at --**HALF BRAKES.**

But you can take full advantage of the Ram-air's controls using an angle of descent that is--**HIGH AND STEEP.**

Having a high final will give you more time and more options.

On a high final, you can slow your airspeed down to where you can--**SINK THE CANOPY.**

Adjusting your angle of descent will help you establish a good --**SIGHT PICTURE.**

When your angle looks good for descending into the spot--**EASE THE TOGGLES UP**. Do not throw your hands up while in the sink mode or the canopy will surge.

Remember to--**USE THE ALLEYWAY** leading into the jump spot to help reduce the steepness of your descent.

--**AIM FOR THE SHORT END** of the meadow closest to you, not the center, as you are more likely to overshoot than undershoot on a no-wind day.

AVOID NO-MAN'S LAND which is being directly over the spot too high to make it in and too low to whip a 360.

Expect an increase in forward speed as the trees shield the wind. Do not go to a deeper brake setting, instead--**HOLD WHAT YOU'VE GOT.**

Do not make any radical maneuvers as you get close to the ground. Smooth **OFF-HAND TURNS** are okay to avoid obstacles.

Part Four: The Landing

Hopefully, your angle of descent will take you to the near edge of the opening you are shooting for.

The nature of the Ram-air is that it needs forward speed in an air mass to keep flying safely.

If you land in a no-wind situation or with a slight tailwind, you will need to land with sufficient forward speed to have a safe landing.

The good news is the forward speed will help you get off your feet better and the shock of landing is better distributed.

The bad news is obstacles on the ground are more hazardous.

Using small corrections with smooth, offhand turns to avoid hazards is advisable.

Remember, the upper wind you had above the trees will now be shielded and your forward speed is likely to increase.

It is important not to mistake the extra forward speed with safe flying speed.

If the forward speed picks up, the tendency is to further pull down on the toggles. That is a

mistake if you are already in a deep brake setting.

If you are in a deep brake setting to approach a spot, you will **NOT** punch out the toggles.

You will instead hold that brake setting, keeping the canopy well within the safe flight mode.

Half brakes is a good, safe setting for most situations, giving you time to react and getting you into position for an acceptable landing.

If--and only if--you have the time and the space, ease the toggles up to gain some forward speed for landing. And then, just as slowly, ease the toggles back down for a flared landing.

A slow flare rather than a fast one will give the canopy more time to react.

And if you have started your flare too high, you can stop pulling the toggles down part way and "stage" the flare.

If there is not sufficient time or space for a flared landing, hold a safe brake setting all the way to the ground.

Again, do not punch out a deep brake setting. It is completely feasible to land with your hands by your reserve, elbows in.

If you are so inclined, you can move you're hands down at the last moment before landing to be completely clear for landing.

The most important element of the landing is the roll.

Landing rolls should be practiced, taken seriously and done every time.

In down air or coming in with too deep of brakes or punching out the toggles too soon will result in a hard landing.

There is also an increase in rate of descent and forward speed at high elevations, further necessitating a good roll.

The landing roll is an integral part of the jump, not an afterthought.

So keep your feet together, your arms in and be ready to roll.

Another point regards proper landing position. Be careful not to bring your feet up as you pull the toggles down. Such a position will make a roll impossible and an injury probable if an obstacle is encountered.

After landing, where feasible, do your bro's a favor and deploy a drift streamer for those following you.

Even with no wind showing on the streamer, it will give the jumpers information that will help their approach.

VIDEO SUMMARY

We've presented some tips on parachute jumping, some basic and some more advanced. A lot of the basic things we've taught all along will help you in making those jumps into tight spots, such as doing a good stall check, wind check and pattern.

While there is a lot of information to remember, it is simple when you break it down and respond to each situation as it happens.

Some key points to remember:

- Make a plan.
- Have alternate spots in mind.
- Practice slow flight; learn to sink the canopy safely.
- Use offhand turns and smooth toggle movements.
- Don't punch out from deep brakes.
- Do a flared landing only if you have the time and space to ease the toggles up and then down again.
- When in doubt, go to half brakes.
- Keep the canopy flying.
- Do a good roll.

RAM-AIR PARACHUTE JUMP TECHNIQUES

ITEMS TO COVER

__planning a jump	__wind check
__communication	__release RSL after wind check/key point
__size up of spot/weather	__watch other jumpers
__low pass	__steep final
__alternate spots	__the sink
__plan B	__sight picture
__hazards	__toggle movements
__alleyways	__sink recovery
__jumpspot weather	__no-man's land
__wind indicators	__half-brakes on landing
__wind blocks	__landing
__overflying hazards	__forward speed
__going low	__half-brake landing
__airspace monitoring	__punching out
__orient to spot	__staged flare
__slow flight	__landing rolls
__stall check	__drift streamers
__stall recovery	

Lesson V JUMP SPOT SELECTION

Students will be introduced to preferred conditions and "rules of thumb" for selecting a place to land a Ram-Air parachute.

LESSON OBJECTIVE:

At the completion of this Lesson, the students must:

- **Identify desirable features for a jumpspot.**
- **Identify hazardous features for a jumpspot.**

EQUIPMENT NEEDS: Dry erase board and dry erase markers and/or projector

POWERPOINT FILE LOCATIONS:

AK: See current year RATM file for power point lessons.
BOI: S:\TRAINING\RATM\Powerpoint Lesson Plans\JumpspotWx.ppt

Instructors Note: Pictures are worth a thousand words. Use the jump spot selection presentation or a slide tray full of jumpspot pictures.

Role of Jumper

The spotter is responsible for selecting the jumpspot but the jumper has input into the selection process. A jumper has veto authority over the spot selected if the jumper doesn't believe he/she can safely jump the spot.

Desirable Jump spot Features

Low turbulence
Clean landing area
Safe from fire
Unlikely to damage parachutes
Natural or easily cleared helispot
Close to anchor point
Close to work area
Close to water sources
Close to road for briefing incoming forces or demobilization.

Jump Spot Hazards

Lee side of anything
Rising terrain
Tall timber
Snags
Hardwoods
Power lines
Fences
Deadfall
Ice
Water
Old helispots or fire lines
Yucca
Rocks

JUMPSPOT SELECTION continued…

Jump spots are selected by the spotter to maximize the potential for operational effectiveness while minimizing risk. A jumper needs to be cognizant of the different factors inherent to any jump spot so that the intent is realized. A jumper has veto authority over the spot selected if the jumper doesn't believe he/she can safely jump the spot.

OBJECTIVE:

- **Identify desirable features for a jump spot.**
- **Identify hazardous features for a jump spot**.

The jumper's point of view is mainly from the plane; however, there is some mention where the jump spot perspective is in regards to firefighting.

Desired Jump spot Features	***Jump Risk***	***Operation Effectiveness***
Clean Landing Area	▼ Fewer ground obstacles lessens chance of injury upon landing.	▲ Stronger jumper work force.
	▼ Greater flexibility—you don't have to be exact as to where you land in the jump spot.	▲ Quick cargo retrieval time—no need to hack at trees and brush to untangle lines.
	▼ Parachute.	▲ An undamaged chute allows field rigging and reuse of chute, especially if called to an area where there are no replacements chutes available.
Safe From Fire	▼ Choose a jump spot near the flank or tail or where natural barriers exist. This enables jumpers to more easily reach a safety zone. Consider the fire activity and measure it against the last few fires you've jumped. Also think about time of year, like early June where fire behavior is usually moderate, which allows you to land closer.	▲ Unthreatened gear does not take time away from fire or the jumpship having to return to resupply the fire.

Key:
▼ Minimizes
▲ Maximizes

Desired Jump spot Features Cont.	***Jump Risk***	***Operation Effectiveness***
Close to Anchor Point	▼ Allow jumpers to secure the fire sooner and establish a safety zone.	▲ Extended retardant from the anchor point helps to secure gear.
Close to Work Area	▼ Less unburned fuel distance between the fire and the jump spot. ▼ Safety zone easily accessible.	▲ Shorter travel time and reduces opportunities of injury when hiking through difficult terrain. ▲ Quick access to gear and additional personnel when they arrive on the fire.
Close to Water Source	▼ Being close to water allows the jumper to get to the safety zone quickly. Water's edge a good place to store jump gear and equipment.	▲ Jumpship can stagger drops of pump and hose for a quick progressive trunk line. ▲ Helicopter dip-site for buckets.
Close to Road	▼ Possible boundaries and barriers for initial or extended attack.	▼ Serves as a good check-in area to brief incoming forces. ▲ Not dependent on helicopters if on a road system. Quick demobe possible.

Key:
▼ Minimizes
▲ Maximizes

Undesired Jump spot Features	***Jump Risk***	***Operations Effectiveness***
Rising Terrain	▲ Landing into the hill could cause injury.	▼ Cargo drops could take more time due to treacherous terrain. Cargo can also be delayed when thermal updrafts keep jumpers in the air longer.
Tall Timber	▲ High probability of a lengthy letdown. ▲ Falling out of a tree might cause serious injuries. ▲ Turbulence near treetops could make it difficult to land safely in jump spots.	▼ Cargo drop will likely be delayed if a jumper trees-up. Possible problems retrieving cargo as well. ▼ Damaged chutes could not be field rigged and so the other fire was not jumped near the one you just demobe off of—Dillingham.
Side Hill Landings	▲ Hill's steepness could be a safety problem if a jumper doesn't contour the hill. ▲ Possibility of spot fires if debris rolls below the jumper. Though ease of movement (least desirable being uphill) to escape routes and safety zones. The ease of movement is a big advantage for suppression activities as well.	▼ Cargo will most likely roll downhill.
Snags	▲ Snags have been known to fall over if landed in, which could also snap tops, increasing likelihood of injury.	▼ Disruption of jumps operations. Jumpship might have to return if climbing gear is not on board.

Key:
▼ Minimizes
▲ Maximizes

Undesired Jump spot Feature cont.	***Jump Risk***	***Operations Effectiveness***
Hard-Woods	▲ Brittle and possible injury when landing in them	▼ Cargo could hang-up in a dense tree canopy. Time would most likely be added until cargo was remedied.
Power Lines	▲ Could be hard to see—more so in fading light. Greater risk for serious injury.	▼ Higher probability that jump operations will need to be adjusted so one-man sticks can be accomplished safely.
Fences	▲ Blends in with landscape and presents a hazard.	▼ One man sticks possibly.
Deadfall	▲ High risk of extremities catching as the chute carries jumper forward on landing. ▲ Fuel loading covering stumps is difficult to measure and often revealed too late.	▼ Higher probability that the parachute will catch and tear and rendered unusable ▼ Fire could threaten cargo and personal chutes during the lengthy processes it takes to retrieve the gear.
Ice	▲ Higher probability of injury occurring if a jumper busts through ice. The situation will likely be more serious if bodies of water went undetected due to snowy landscape.	▼ Possibility more jumpers needed to help assist with medical attention, or warming fire.

Key:
▼ Minimizes
▲ Maximizes

Undesired Jump spot Features Cont.	***Jump Risk***	***Operations Effectiveness***
Water	▲ Greater risk of landing in water and a rescue required. ▲ More jumpers needed.	▼ More time setting up nonstandard jump operation pattern (crosswind) or adjustments so one-man sticks can be accomplished safely. ▼ Cargo could land in water.
Old Helispots or Fire Lines	▲ Punjies are not apparent until too late. Sharp stobs could puncture jumpsuit and body. ▲ High slash around the perimeter can be hazardous. ▲ Minimal work needed to improve helispot.	▼ In the event that gear needs to be centrally located, it could take a while if you have to climb over a lot of brush to move the gear.
Yucca	▲ The ground will most likely be hard and rocky. ▲ Sword-shaped leaves and other pointy vegetation can be hazardous. ▲ And can shred parachutes.	▼ Plants could puncture water cubies and the fire would need to be resupplied. ▼ Medical attention might be needed. ▼ Field rigging may not be possible.
Rocks	▲ Smaller rocks are better than big boulders. Have plenty of alternates. ▲ Rocks can be disguised by brush—more so with Lower 48 clear-cuts. ▲ Large outcroppings can be notorious for blocking wind. Do a good roll and try to have fun.	▼ In regards to fire operations rocks can save time as anchor points, and or to connect the dots. ▼ Possibility of more jumpers needed to assist with medical attention.

Key:
▼ Minimizes
▲ Maximizes

Lesson VI SPECIAL JUMP SPOT SITUATIONS

Students will be introduced to special jump spot situations which may occur even though they are not desired. These situations can affect the jumper's flight plan and/or landing zone. The student will be given ways to minimize the risks of injury if these situations present themselves in the field.

LESSON OBJECTIVE:

At the completion of this Lesson, the students must:

- **Identify and describe verbally at least 5 special jump spot situations and accurately describe techniques for minimizing the risk of injury in these situations.**

EQUIPMENT NEEDS: 1 ea. - dry erase board and dry erase markers. (or chalk board).

RIGHT OF WAY

1. The right of way always goes to the lower jumper or to the jumper in the blind.
2. If two jumpers are converging on one another, each should slow down and turn away from the other. This often happens on final when two jumpers approach the spot from different angles. A jumper should never get so fixated on the spot that he doesn't know where the other jumpers are. If you are converging on another jumper on final, yell at him to get his attention. Do not assume that the other jumper sees you. Turn away from the spot and land in an alternate spot, if need be. **ALWAYS SACRIFICE ACCURACY FOR SAFETY!**

TREE LANDINGS

1. Avoid hardwoods and snags; they are brittle and tend to break.
2. Always approach into the wind.
3. Pick a specific tree to land in. Steer for it just like you would for a spot on the ground. Smaller trees are generally better.
4. Approach the tree at half brakes.
5. Aim about 6 to 10 feet below the top of the tree so the canopy will cap the tree.
6. Ease into the tree with some forward speed.
7. Keep hands and arms close to the body until you have stopped falling to avoid snagging on limbs.

8. Visually check how well you're hung up but don't bounce to test.
9. If the canopy is not secure in the tree (slipping), then try to insure a solid anchor point. For example, pull yourself into the trunk of the tree and tie off to it before proceeding with the letdown.

HIGH WIND LANDINGS

A problem with high wind landings is getting dragged by the parachute once on the ground. If you know it's windy always:

1. Face into the wind
2. Make sure your RSL has been disconnected
3. Don't perform a full performance flare.
4. Cut away the canopy after you hit the ground.
5. Pull down on one toggle. This will cause the canopy to fly itself into the ground.

WATER LANDINGS

If you find yourself coming down over water you should steer for the nearest shore. Don't give up; keep steering for shore as long as you can. Your jump partner should bring his letdown rope to the nearest point of land in order to assist you. When a water landing is imminent you should do the following:

1. Make sure your RSL is released. This will prevent your reserve from deploying when the main canopy is cut away after landing. A reserve deployment in the water will compound problems, especially in moving water.
2. Turn and face into the wind; set up as if you are making a normal landing.
3. Flare the canopy before splash down just as you would for any landing; be prepared to do a PLF. Facing into the wind and flaring on landing will cause the canopy to land behind you rather than on top of you.
4. Execute a PLF upon landing.
5. As soon as you hit the water cut away your canopy by pulling your main release handle.
6. Float face up. In swift water, float feet first downstream.
7. Don't panic if canopy is covering you. The facemask provides airspace. Clear the canopy by pulling from overhead toward stomach. Remember your reserve knife in case you need to cut lines.
8. Back paddle to shore.
9. Retrieve parachute only in non-critical situations. If situation is non-critical parachute can be retrieved by tying your letdown rope to a riser and dragging the canopy in with the letdown rope after you've reached the shore. NEVER TIE THE PARACHUTE TO YOURSELF.

ICE LANDINGS

If you find yourself coming down over ice you should steer for the nearest shore. Don't give up; keep steering for shore as long as you can. Generally, ice is thin during jump season and a jumper will break through it and into the water. Your jump partner should bring his letdown rope to the nearest point of land in order to assist you. When an ice landing is imminent you should do the following:

1. Do a good PLF. Thick ice is a particularly hard surface.
2. If you break through the ice, crawl up onto the surface as quickly as possible. If the ice is too thin to support your weight while standing, lie flat and crawl.

Jump Partner Responsibilities: If you see your jump partner go into water or ice, you must insure that he makes it safely to shore. There are a few things you should do and be thinking about:

- Grab your letdown rope.
- Throw your J.P. one end of your letdown rope and try to haul him in.
- Stay off the ice.
- If your JP goes through the ice or lands in water, build a fire as soon as you get him to shore and dry him out; watch for signs of hypothermia.

POWER LINE LANDINGS

Do whatever you must to keep from landing in power lines, even if it means doing a downwind landing. If collision with a power line is imminent

1. Bring your arms in tight across your chest.
2. Make sure your feet and knees are together (make yourself as streamlined as possible so you don't bridge on any two lines).
3. Try to zero out your airspeed (but don't stall), so that you come straight down between the power lines.
4. **Do not** grab any power lines.

If you hang up in the power lines, you have the following options:

- Have someone call the power company and have them turn off the power before you do anything.
- If you're not too high off the ground, you may elect to cut away without tying off to your canopy with your letdown rope. Make **sure** your RSL is disconnected. Remove the knife from the reserve container. Release your P.G. bag and reserve and drop them to lessen the impact when you hit the ground.

- If you do a letdown, **DON'T DROP YOUR LETDOWN ROPE TO THE GROUND, LEAVE IT IN YOUR LEG POCKET.** If you drop your letdown rope to the ground, you will ground yourself out and roast like a wiener!!
- When you're about ten feet off the ground, while holding yourself in place by grabbing the rope above your O-rings or friction device, cut your letdown rope cleanly below your O-rings or friction device. Then, let go of the rope and fall to the ground.

Lesson VII FUNDAMENTALS OF SPOTTING

This lesson explains to the student the basic procedures that a spotter employs to safely drop jumpers. Knowledge of these procedures will assist a jumper in making a valid jump plan.

LESSON OBJECTIVE:

At the completion of this lesson the student will:

- **Identify average wind direction based on landing location of streamers.**
- **Determine average wind speed based on landing location of streamers and spotters estimate of drift.**
- **Explain how the presence of up or down air is determined.**
- **Explain how wind variations will alter the standard pattern.**
- **Identify 3 types of jumpship patterns that are used to drop jumpers.**

EQUIPMENT NEEDS:

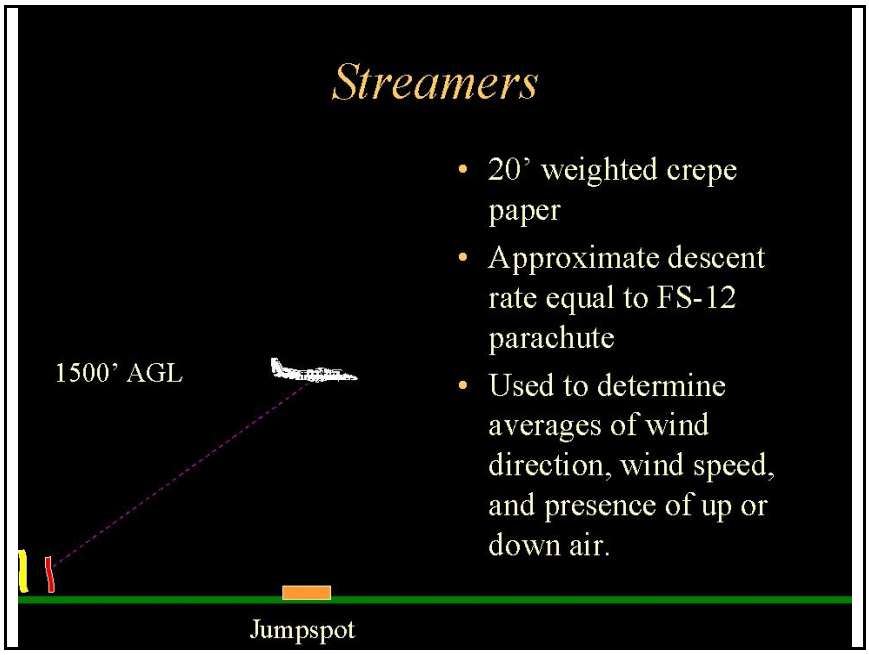
1 ea. - Flip chart/Dry Erase Board or PowerPoint Projector

POWERPOINT FILE LOCATIONS:

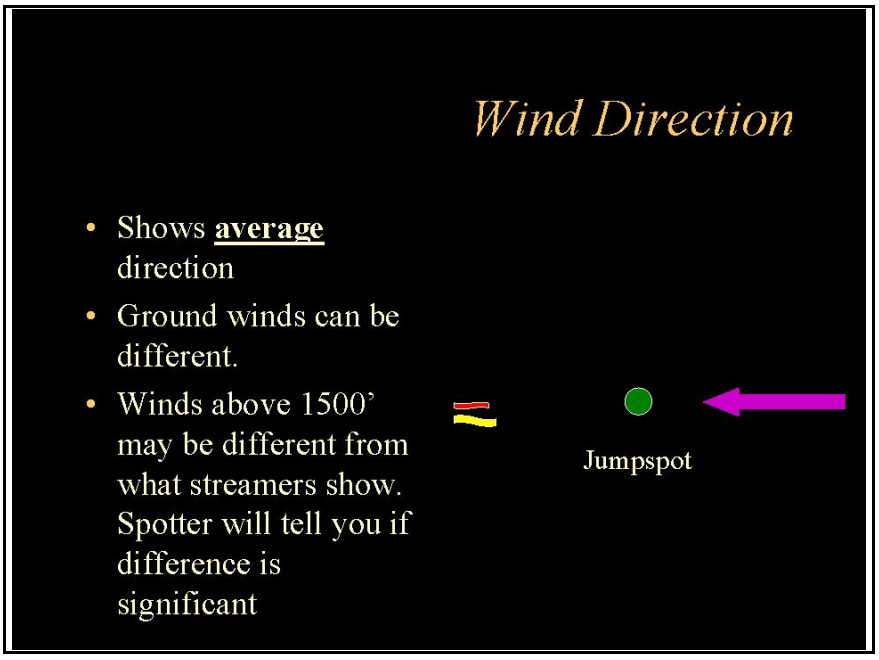
AK: See current year RATM file for power point lessons.
BOI: S:\TRAINING\RATM\Powerpoint Lesson Plans\

Fundamentals of Spotting

I. Streamers



Streamers are 20 foot long pieces of colored crepe paper that a spotter uses to determine wind information. The streamers are weighted to have a descent rate approximately equal to the round parachutes used by the Forest Service. Dropped prior to each jump, a spotter can determine information on wind direction, wind speed and the presence of up or down air based on the streamer's flight, landing location, and time of descent.

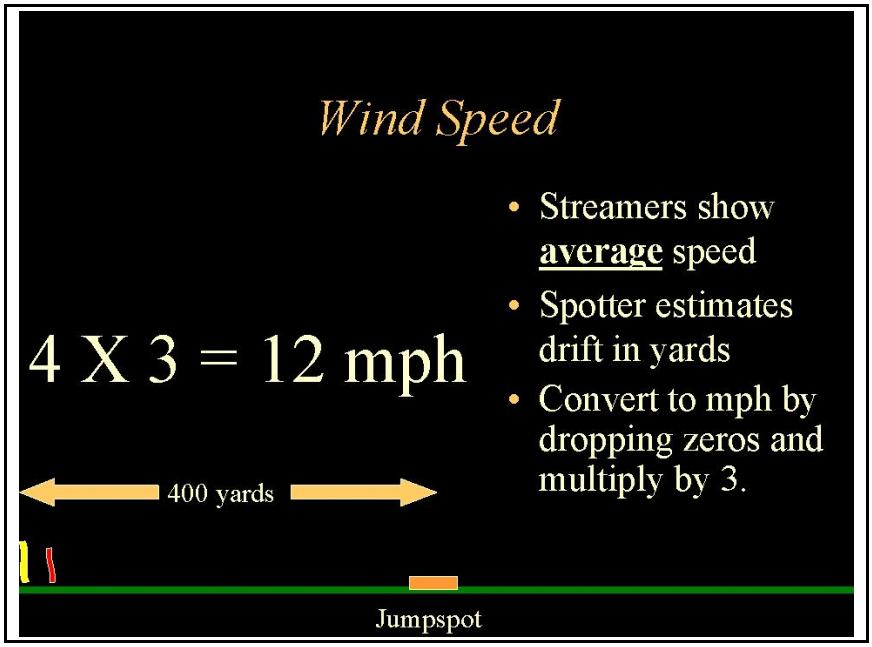


A. Wind Direction

Streamers drift with the wind. By knowing the point that the streamers are released from the aircraft and their landing location it is possible to determine the average direction of the wind. The wind at any particular altitude may be different than what the streamers showed but knowing the average direction will give a jumper the information needed to begin forming a jump plan.

B. Wind Speed

The distance between the streamer's release point and their landing location shows the average wind speed. The greater the distance, the greater the average wind speed. Spotters will estimate the drift in yards and this estimate will be part of the prejump briefing given to a jumper prior to exiting. For example, "The streamers showed 400 yards of drift." Some jumpers prefer to think in terms of mph. Yards of drift can be converted to mph through a simple formula. Convert to mph by dropping the zeros in yards of drift and multiplying by 3. For example, 400 yards of drift equates to a 12 mph wind speed.

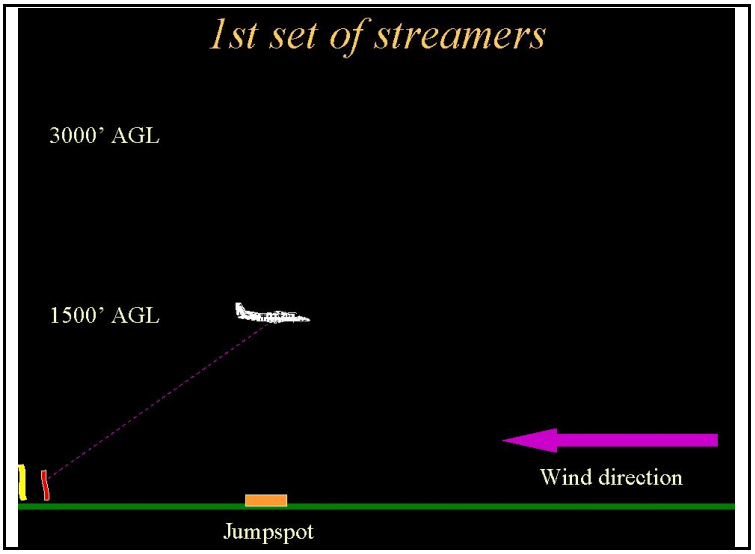


C. Up or Down Air

The presence of up or down air can be determined by timing how long it takes the streamers to descend. In vertically calm air, streamers will take 70 to 75 seconds to fall 1500'. Usually, the spotter will feel comfortable with anything over 60 seconds. The time of the last check set of streamers is more important than earlier sets as they are passing through the same body of air that the jumper will.

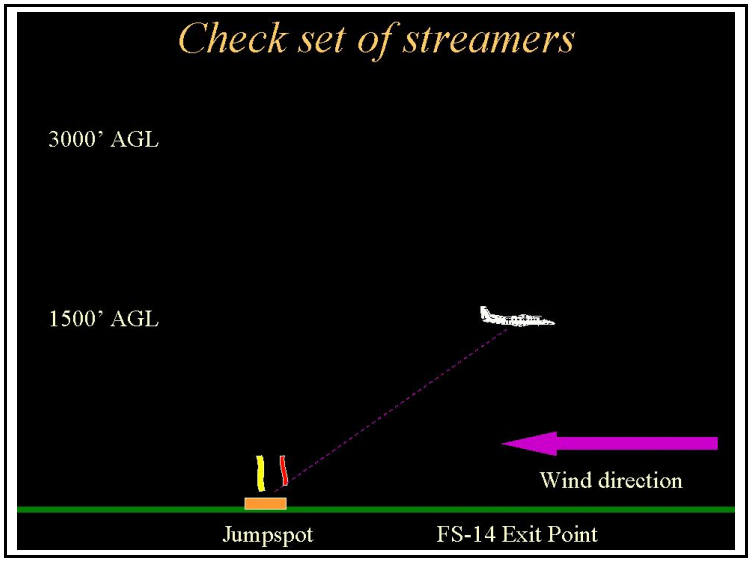
D. 1st set of Streamers

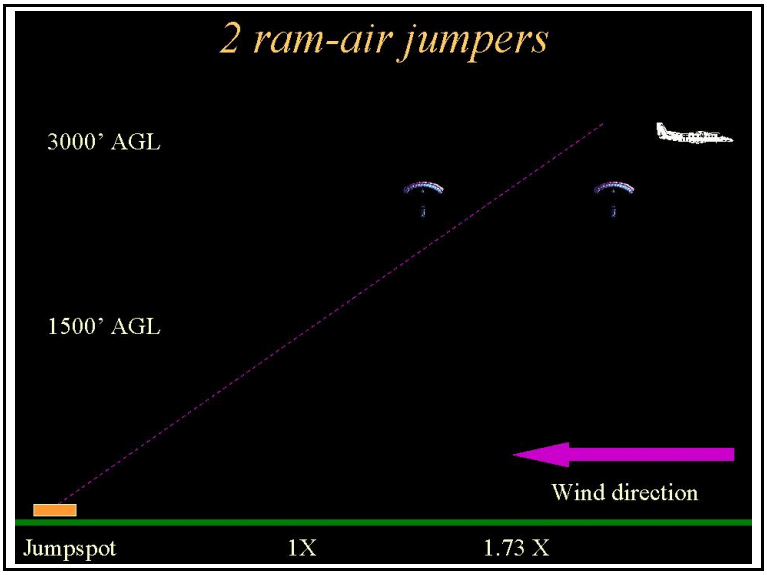
The first set of streamers is dropped over the jumpspot from 1500' AGL. The spotter guides the pilot over the spot to ensure that the streamers are released directly over the jumpspot. The spotter watches the streamers during their descent, notes their landing location, and times their descent rate.



E. Check Streamers and Exit Points

Check streamers are dropped from 1500' AGL to determine the proper exit point. Check streamers landing in the jumpspot or immediate vicinity confirm the proper release point for round jumpers. Square jumpers are normally dropped from 3000' AGL so the square exit point is further upwind than the round exit point. Taking into account the loss of 400' in altitude prior to main canopy deployment, the theoretical perfect square exit point is 1.73 times further than the round exit point. The actual exit point used is determined by the spotter taking a variety of factors into consideration. Typical square exit points range from 1.5 to 2 times the round exit points. Typically, the first jumper in a stick is dropped "short" and the last is dropped "long". A spotter may drop streamers from 3000' AGL when there is evidence of significant differences in wind direction or speed from 1500' to 3000' AGL.





F. Watching the Streamers

Seeing the streamers can be challenging. The limited number of windows, maneuvering of the jumpship, and poor visibility can and will make streamer observation difficult. Tenacity is usually rewarded so don't give up. The spotter provides information on what the streamers showed during the prejump briefing but it is better if the jumper also saw the streamers.

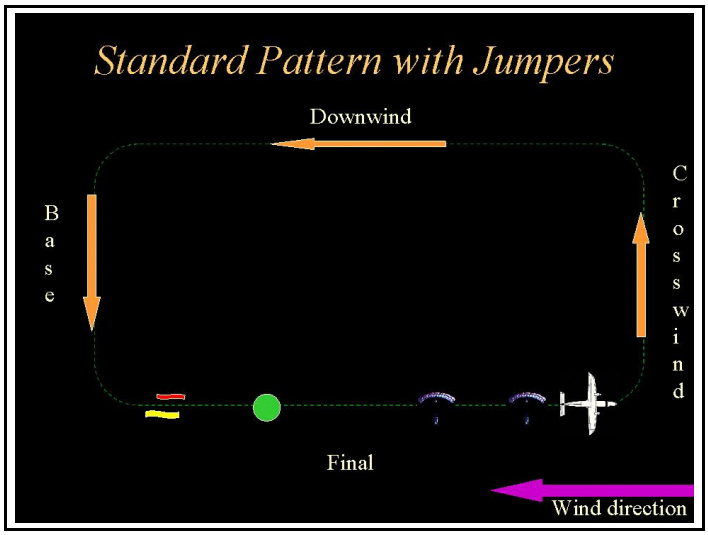
G. Reading the Streamers

Watching the streamers is important because they provide information helpful in making a jump plan and executing a safe jump. The last 500' of their descent is probably the most important as this will indicate what the winds will be when on final. Turbulence may be indicated when streamers' tails fold over or wave erratically. Streamers that pile up when they hit the ground indicate no wind on the ground. Streamers that "lay out" when they hit indicates high wind on the ground.

II. Jumpship Patterns

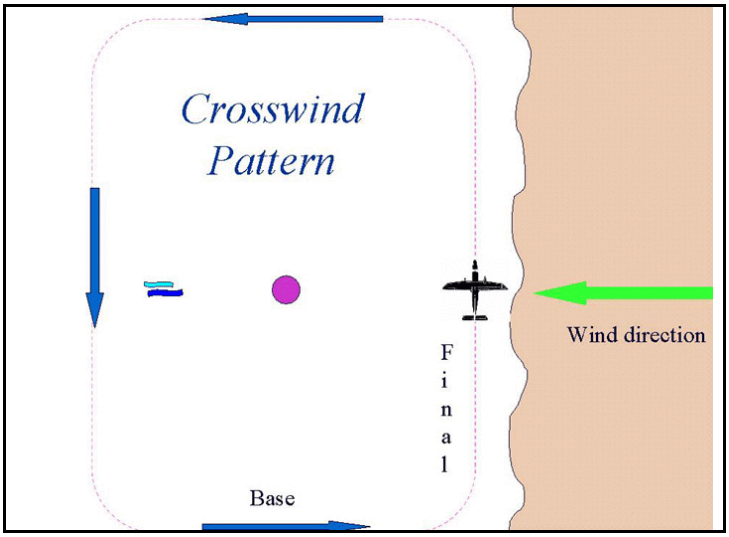
Jumpship patterns are designated by how the final heading's direction compares to the wind direction indicated by the drift streamers. Typically, the same pattern is used throughout a mission. The three types of patterns are: 1) Standard, 2) Crosswind, and 3) Downwind. Patterns are comprised of crosswind, downwind, base, and final legs.

A. Standard (into the wind)



Standard patterns are the most common due to their simplicity and ease of execution. The pattern is identical to the normal landing approach for aircraft and square parachutes with final being directly into the wind. The resulting minimal ground speed makes it relatively easy for the spotter to correctly line up the aircraft over the exit point. Because pilots and jumpers are accustomed to it, briefings are simplified and the potential for mis-communication decreases. Perhaps the biggest disadvantage to the standard pattern is the fact that it becomes such a habit for everyone that it is used in situations when other patterns would be better.

B. Crosswind



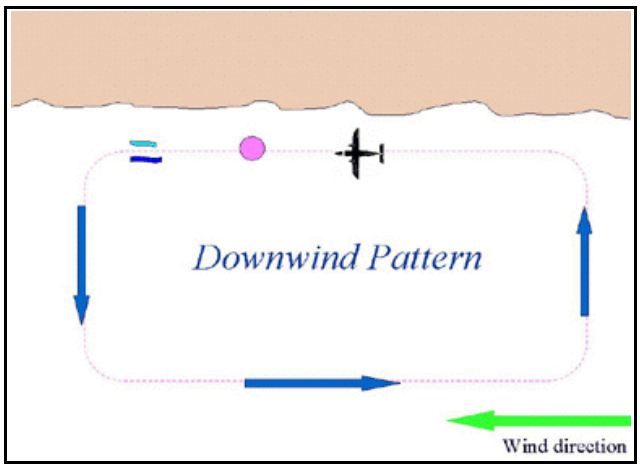
Crosswind patterns are most frequently used when some hazard or a rising terrain feature upwind of the jumpspot precludes an upwind final. Typical hazards include large bodies of water or smoke columns.

There are some inherent advantages to crosswind patterns. A final crosswind heading with the jumpspot to the left of the aircraft provides both spotter and jumpers with the best view of a jumpspot. All jumpers exit the aircraft about the same distance

upwind. Also, there is a reduced potential for dropping jumpers on preceding sticks or from tandem dropping aircraft.

Disadvantages include jumpers being let out off the wind line, increased difficulty in lining up jumpship on final, tendency for jumpship to drift toward jumpspot on final, and the potential for need of more elaborate briefings.

C. Downwind



Downwind patterns are rarely used. Typically, a downwind pattern is used only when a standard or crosswind pattern is not possible because of terrain and/or other hazards.

Downwind patterns feature the final leg being flown with the wind. This increases the likelihood of a spotter releasing the jumpers closer to the jump spot than desired. Also, the first jumper exiting the aircraft will be further from the jumpspot than subsequent jumpers. Both factors should be taken into account when formulating a jump plan.

Lesson VIII JUMP SPOT WEATHER

Students will be visually introduced to actual jump spots encountered by jumpers in Alaska, the Great Basin, and at Forest Service bases. Influential factors such as terrain, ground hazards and weather conditions will be discussed as they relate to jump spot selection and evaluation.

LESSON OBJECTIVE:

At the completion of this lesson, the students must:

- **Identify and describe verbally at least 6 influential factors that are pertinent to jump spot selection and evaluation.**
- **Describe verbally how given weather and topographic conditions can effect a landing on a given jump spot.**
- **Accurately identify ground hazards, alleyways, and alternate jump spots on a given slide projection.**

EQUIPMENT NEEDS:

1 ea. - Slides for "Jump Spot Weather", projector and screen.
1 ea. - dry erase board and dry erase markers. (or chalk board).

POWERPOINT FILE LOCATIONS:

AK: See current year RATM file for power point lessons.
BOI: S:\TRAINING\RATM\Powerpoint Lesson Plans\JumpspotWx.ppt

Instructor's note: Visual imagery and analysis of jump situations from the previous season are especially useful. Lessons learned should emphasize the importance of local weather conditions in all-terrain parachute jumping and how to recognize and mitigate associated hazards. The pictures and graphics in the PowerPoint library should be upgraded as needed to include a wide variety of jump spots.

POWERPOINT PRESENTATION

Jump spot weather class is taught using an LCD projector and digital images within PowerPoint files. Presentations show a variety of jump spots encountered by jumpers in Alaska, the Great Basin, and at Forest Service bases. A library of jump spot related programs has been developed which can be presented as appropriate during jump training. This topic should be repeated if a significant time has elapsed from initial jump training to actual fire season.

Each picture or graphic should teach a lesson about wind, weather, terrain, patterns or ground hazards. Instructor notes should be available for each slide.

The instructor will describe each situation, and ask students what they think might be the hazards involved and the proper pattern and approach needed to mitigate those hazards.

Some pictures or graphics will benefit from explanation on a dry erase board or chalkboard.

THE INSTRUCTOR SHOULD CALL ON STUDENTS AND HAVE THEM DEMONSTRATE THEIR UNDERSTANDING OF THE MATERIAL AND MONITOR THEIR SUCCESS IN MEETING THE OBJECTIVES.
SLIDE PRESENTATION

Lesson IX TERRAIN JUMPS (Optional)

Students will examine hypothetical terrain situations that are commonly found in smokejumper operations. Successful jumps into rugged terrain require jumpers to identify set-up areas that best mitigate the situational hazards.

LESSON OBJECTIVE:

At the completion of this lesson, the students must:

- **Identify areas of probable clean air and turbulent air.**
- **Identify set-up areas that minimize potential for landing into rising terrain and maximize potential for landing in areas of clean air.**

EQUIPMENT NEEDS:

1 ea. – laptop with PowerPoint, LCD projector and screen.

POWERPOINT FILE LOCATIONS:

AK: See current year RATM file for power point lessons.
BOI: S:\TRAINING\RATM\Powerpoint Lesson Plans\Terrain Jumps.ppt

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Instructor's note:

POWERPOINT PRESENTATION

The Terrain Jumps class is taught using an LCD projector and digital topographical images within PowerPoint files. Presentations show basic terrain problems that are common in areas of operation.

The instructor will describe each situation, and ask students what they think might be the hazards involved and the proper pattern and approach needed to mitigate those hazards.

Some pictures or graphics will benefit from explanation on a dry erase board or chalkboard.

THE INSTRUCTOR SHOULD CALL ON STUDENTS AND HAVE THEM DEMONSTRATE THEIR UNDERSTANDING OF THE MATERIAL AND MONITOR THEIR SUCCESS IN MEETING THE OBJECTIVES.

Lesson X HIGH WIND JUMPS

Students will be introduced to high wind jump techniques. Good techniques to utilize in high wind situations will be explored as well as common mistakes.

LESSON OBJECTIVE:

At the completion of this lesson, the students must:

- **Identify good techniques to utilize in high wind situations.**
- **Identify set-up areas that maximize accuracy and safety in high wind situations.**
- **Identify common mistakes that occur in high wind situations.**

EQUIPMENT NEEDS:

1 ea. – laptop with PowerPoint, LCD projector and screen.

POWERPOINT FILE LOCATIONS:

AK: See current year RATM file for power point lessons.
BOI: S:\TRAINING\RATM\Powerpoint Lesson Plans\Terrain Jumps.ppt

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POWERPOINT PRESENTATION

The High Wind class is taught using an LCD projector with video clip examples of jumps in high wind conditions.

THE INSTRUCTOR SHOULD CALL ON STUDENTS AND HAVE THEM DEMONSTRATE THEIR UNDERSTANDING OF THE MATERIAL AND MONITOR THEIR SUCCESS IN MEETING THE OBJECTIVES.